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MODULE AND BATTERY PERFORMANCES COMPARISON OF A PHOTOVOLTAIC SYSTEM FOR SMALL-SCALE SYSTEM

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ABSTRACT

It is known that the utilization of PV system has been demanding and increasing recently due to concern about the earth environment and also increasing the price of the conventional energy sources. The increase is not only for industry and large-scale applications but also for small or housing scale systems. For the latter case, the PV system components especially battery and module commonly used are usually the ones which are widely available and easily bought in traditional markets or shops. Therefore, the present study will investigate the performance of battery and module for a PV system which are mainly available in the traditional shops and commonly used for small scale system. It is found from the study that maximum of PV module efficiency used in the present study is 71.59 % for sealed battery and 68.7 % for flooded battery charging. Moreover, it can also be concluded that the performance of the sealed battery is higher than flooded battery type.

Keywords: *Photovoltaic System, Energy Storage, Solar Module, Small Scale, Solar Component Performances.*

INTRODUCTION

Based on data collected by IEA [1], the electrification rate in developing countries is 74.7 % and in their rural areas is 63.2 %. These ratios are lower than the world electrification rate which are 80.5 % and 68 %, respectively [2, 3]. Therefore, strong and continuous efforts have been attempted by the governments in these countries to increase their country's electrification rate.

Especially in Indonesia, the electric demand is not only due to low electrification rate but also because of the strong economic growth and rapid technological development. Unfortunately, the government-owned electric company named Perusahaan Listrik Negara (PLN) which is the only electric company in Indonesia, still has problems in providing enough and stable electric especially in rural areas. The problems are not related to lack of electric power but also power transmission which cause sometimes either scheduled or abrupt shutdowns.

In order to reduce the effect of the problems, the government has encouraged public and private companies to invest in renewable energy sector. The chances are given not only to big scale companies but also to individual and house-scales system. Therefore, the use of solar home system of photovoltaic (PV) system has increased recently. Photovoltaic system is chosen because it is known to have lowest investment cost as compared to other renewable energy sources. Moreover, this PV system is quite potential to be used in Indonesia considering the intensity and duration of sunlight in Indonesia which is quite long and relatively constant throughout the year. In addition, the cost and component prices are also becoming cheaper which makes this system can be one of the most appropriate alternative.

In this study, performance of main components of a small-scale photovoltaic system i.e. photovoltaic module (PV) module and battery, is measured and analyzed. The main aims of the investigation are to evaluate the technical and economic performance of both components. The information is important for people who are interested to implement a cheap and small-scale PV system. Therefore, the specifications of both components are selected based on their convenience to be found and bought at traditional stores or markets.

From the results of this study found that the efficiency of PV module used in the measurement is 71.59 % for sealed battery and 68.7 % for flooded battery. In addition, it is also found that the performance of sealed battery is better than flooded battery.